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NOTE

Compsobraconoides (Braconidae: Braconinae), the First Hymenopteran Ectoparasitoid of Adult *Azteca* Ants (Hymenoptera: Formicidae)

Douglas W. Yu and Donald L. J. Quicke

(DWY) Department of Organismic and Evolutionary Biology, Harvard University, Cambridge, MA 02138-2902, USA; (DLJQ) Department of Biology, Imperial College at Silwood Park, Ascot, Berkshire SL5 7PY, U.K.

Azteca ants (Dolichoderinae) are an important group of plant symbionts in the Neotropics (Davidson & McKey 1993). The ant queens colonize bulb-like domatia in ant-plants (Davidson *et al.* 1989, Yu & Davidson in press). Work on three species of *Azteca* that colonize the ant-plant *Cordia nodosa* Lam. (Boraginaceae) in the Madre de Dios area of Peru has revealed that the queens of all three species are subject to parasitism by a braconid wasp, which may be important for regulating ant populations (Yu & Pierce in preparation). One of the *Azteca* species has been identified as *A. ulei*, but the other two species are undescribed and are here referred to as *A. depilis*1 and *A. depilis*2. The wasp, a species of *Compsobraconoides* (Braconinae), is a principally solitary, idiobiont ectoparasitoid of *Azteca* queens. The host record has been confirmed by rearing an adult wasp from a larva found feeding on a paralysed *A. depilis*2 queen in a domatium (coll. # DY727.2), and by collections of wasp pupae, larvae, and host remains.

Colonizing *Azteca* queens were collected from both planted and naturally occurring saplings at Cocha Cashu Biological Station in Manu National Park, Madre de Dios, Peru, and from naturally occurring saplings at two other sites in Manu Park; the Tayakome and Yomybato indigenous communities. All three sites are located in lowland, moist-to-seasonal tropical rainforest (annual rainfall = 2100 mm) (Terborgh 1983). Of 46 dead *Azteca* queens collected, eight were found with larvae of *Compsobraconoides*, nine with cocooned pupae and 29 with empty cocoons. The *Compsobraconoides* larvae were found feeding on both the mesosoma and the metasoma of *Azteca* queens. Pupating larvae weave both a cocoon and a protective tent, usually located at the distal end of the domatium. The adult wasp emerges by boring a small hole in the domatium wall. The hole is circular and very smooth, and is located directly below the cocoon/silk tent. This is probably an adaptation to avoiding entering the domatium which by the time of emergence might be colonized by another queen and her brood. The carcasses found with the empty cocoons appear to have been almost completely cleaned out by the wasp larvae: their sclerites were largely separated, and there was very little or no fungus present. Six of the ants collected with larvae were found alone in separate domatia, each with a single larva; the other two ants were found together in a single domatium with two larvae feeding on each of them. Rearing was unsuccessful in the latter case, perhaps due in part to inadequate food for the larvae. This was the only case in which more than a single wasp was associated with a single ant. In addition, seven pupae and one empty cocoon were found without host carcasses but with live *Azteca* queens. It is possible that these

newly colonizing queens had removed the previous queen's remains from the domatia. In another case, an empty cocoon was found with a dead, eaten queen of *Myrmelachista* sp., which also nests in *C. nodosa*, but is exceedingly rare (Yu & Pierce in preparation). However, we cannot conclude that the *Myrmelachista* queen was a host of the wasp. No adult wasps or cocoons were found associated with hosts of any other taxa.

Azteca queens lay eggs fairly soon after colonizing a domatium. Unfortunately, we cannot tell whether the parasitized queen had started to produce broods at the time of the attack. Although there was never any brood in the domatium with a parasitized queen, this could either be because the wasp larva had eaten the brood, or because the brood rots quickly when left unattended. It seems likely that wasp attack can take place at any time before workers appear.

The host record is remarkable for three reasons. Firstly, it is the first record of an adult ant being the host of an hymenopteran ectoparasitoid, though neoneurine braconids are probably endoparasitic in worker adults (Shaw & Huddleston 1991, Shaw 1993). Secondly, it is the first record of a member of the Braconinae attacking aculeate Hymenoptera and, thirdly, it is the first record of a braconine attacking any adult insect. Most braconines are idiobiont ectoparasitoids of concealed Coleoptera and Lepidoptera larvae, though a few species attack Diptera and symphytan Hymenoptera larvae (Shaw & Huddleston 1991). Further, this is the first host record for any member of the genus *Compsobraconoides*. The related genera *Compsobracon* and *Cyclaulacidea* have been reared as parasitoids of concealed Lepidoptera and bruchid beetle larvae respectively (Quicke 1989, Quicke & Delobel 1995). *Compsobraconoides* is a moderately large, principally Neotropical genus much in need of revision; the species reported on here is probably undescribed. It seems certain that some other *Compsobraconoides* species attack other hosts since *Azteca* ants are absent from the southern USA (Texas and Florida) where the type species of *Compsobraconoides* occurs (Quicke & Sharkey 1989).

The wasp may play an important role in the ecology of the *Azteca*-*C. nodosa* symbiosis. *C. nodosa* associates not only with the three *Azteca* species but also with *Allomerus* cf. *demerarae* (Myrmicinae), and, more rarely, with *Myrmelachista* sp. (Formicinae). At Cocha Cashu, the most abundant associate is *Allomerus*, inhabiting 77.9% of the plants (1024 plants in total were examined). Workers of *Allomerus* attack and destroy floral buds of their host plants, acting as a castration parasite (Yu & Pierce in preparation). As a result, fruit and pollen production are drastically reduced. The majority of fruit and pollen are apparently produced by the 10.5% percent of the plants inhabited by *Azteca* spp.

As in other ant-plant systems (Yu & Davidson 1997) the identity of the ant symbiont is determined at the colonization stage. The first queen to produce full-size workers is able to take over the plant killing off any other founding queens in the process. *Compsobraconoides* wasps, by preying on colonizing *Azteca* queens, increase the probability of successful establishment by the parasitic *Allomerus* queens.

Thus, the collections of *Compsobraconoides* wasps on *Azteca* ant queens are interesting both for the extreme host-range shift they represent, and also for the ecological problems that the *Compsobraconoides*-*Azteca* interaction poses. What is the role of *Compsobraconoides* in allowing *Allomerus* and *Azteca* species to coexist on the hostplant *C. nodosa*? What prevents *Compsobraconoides* sp. from driving *Azteca* queens and therefore, *C. nodosa*, extinct? That is, how is the host-parasitoid interaction stabilized? And finally, how do the three species of *Azteca* coexist, given that they appear to be engaged in 'apparent

competition' (Holt & Lawton 1993)? Studies of the colonization dynamics of ants and wasps are being undertaken to answer these questions (Yu & Pierce in preparation).

Vouchers of wasps and host carcasses have been deposited at The Natural History Museum, London, and at the Museum of Comparative Zoology at Harvard University.

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